

MICROPLANKTON FROM THE PALEOCENE PEBBLE POINT  
FORMATION, SOUTH-WESTERN VICTORIA

PART 1

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**Abstract**

Three new species, namely *Svalbardella australina*, *Trichodinium hirsutum*, and *Cyclonephelium vitilare* are described from the Pebble Point Formation in Victoria. Previous records of *Cannosphaeropsis caulleryi* Deflandre from this Formation are reconsidered.

**Introduction**

Several microplankton species have already been recorded (Deflandre & Cookson 1955) from the Paleocene deposits comprising the Pebble Point Formation, but hitherto no attempt has been made to determine the composition of the assemblages present at specified levels.

Recently the commencement of such a project was made possible by the provision of samples taken at 4, 6, and 30 ft from the base of the Pebble Point Formation on the SE. side of Dilwyn Bay, SW. Victoria, by Messrs W. K. Harris and D. J. Taylor of the South Australian and Victorian Departments of Mines respectively.

This contribution deals with 3 new species of Dinophyceae from the 4 ft and 6 ft levels. Of these, 2 have been recovered from the deposit sampled at 4 ft from the base of the Formation, the third species from both the 4 and 6 ft samples. The occurrence of *Cyclonephelium retiintextum* Cookson at 4 and 6 ft is recorded.

The figured specimens have been placed in the National Museum of Victoria under the numbers P 23118-23127, and P 23448-23457.

**Systematic Descriptions**

Class DINOPHYCEAE

Family AREOLIGERACEAE Evitt

Genus *Cyclonephelium* Deflandre & Cookson 1955

emended Cookson & Eisenack 1962

***Cyclonephelium retiintextum* Cookson**

(Pl. 24, fig. 8-11)

*Cannosphaeropsis* cf. *caulleryi* Deflandre. Cookson 1953, p. 117, Pl. 2, fig. 35-40.

*Cannosphaeropsis caulleryi* Deflandre. Deflandre & Cookson 1955, p. 283, Pl. 7, fig. 8.

*Cannosphaeropsis caulleryi* Deflandre. Cookson & Eisenack 1961, p. 44, Pl. 2, fig. 12.

*Cyclonephelium retiintextum* Cookson 1965, p. 88, Pl. 11, fig. 4.

AGE AND OCCURRENCE: Paleocene: Pebble Point Formation, SW. Victoria, at 4 ft and 6 ft above the base.

COMMENT: Specimens herein referred to the Australian Upper Cretaceous species *Cyclonephelium retiintextum* are, by their large number and striking appearance, the most conspicuous feature of the microplankton assemblages of the

samples taken at 4 and 6 ft, particularly the one at 4 ft, from the base of the Pebble Point Formation. As can be expected in such a rich population, there is considerable variation in the number and length of the processes composing the network which is situated within the margin of both surfaces of the shell. However, in spite of this variation, both the mode of construction and wide-meshed character of the network is similar to that of the type of *C. retiintextum*. Strands connecting the bases of individual processes, mentioned as occurring in the type, are commonly met with in the specimens under consideration. The processes present on the covers of the archeopyle, the bases of which may be free or united by narrow strands, are so arranged as to outline three circular areas (Pl. 24, fig. 8a).

A few specimens in which the outer connecting strands are considerably flattened and highly perforated (Pl. 24, fig. 10, 11) approach *Cyclonephelium reticulatum* Gerlach (1961) from German Middle and Upper Oligocene deposits. However, the identity of this variant is being left open until more is known regarding its constancy and vertical distribution.

The present record of a species of the genus *Cyclonephelium* with a conspicuous wide-meshed ornament in Victorian Tertiary deposits immediately raises doubt as to the correctness of the somewhat hesitant identification by Deflandre & Cookson (1953) of certain Australian Tertiary specimens with the European Jurassic species *Cannosphaeropsis caulleryi* Deflandre in which the whole surface of the shell is ornamented with a wide-meshed reticulum.

What can now, almost certainly, be regarded as a misidentification is understandable considering the small number of poorly preserved specimens of the so-called *Cannosphaeropsis caulleryi* and the limited information regarding the genus *Cyclonephelium* then available.

This doubt is supported by the fact that, in many of the specimens of *Cyclonephelium retiintextum* seen during the present investigation, the unornamented central portions of the shells have been partially or almost completely obscured by the accidental turning inwards of the network of the side under observation. Furthermore, when flattened specimens similar to the one shown by Deflandre & Cookson (Pl. 7, fig. 8) are lying with the antapex uppermost the absence of the ornament from the central portions of the two surfaces cannot be discerned. The same considerations apply to the earlier, tentative identifications of *C. caulleryi* from Lower Tertiary deposits in Victoria (Cookson 1953) and the Rottneest Is. Bore, W. Australia (Cookson & Eisenack 1961).

### *Cyclonephelium vitilare* n. sp.

(Pl. 24, fig. 1-7; holotype fig. 1, 2, P 23118)

AGE AND OCCURRENCE: Paleocene: Pebble Point Formation, SW. Victoria, at 4 ft above the base.

DESCRIPTION: Shell dorsiventral, almost circular in outline with a short, blunt, apical prominence, ornamented with slightly raised, granular lace-like expansions which extend for short distances beyond the margins. The width of the ornament differs on the two surfaces, being wider and the unornamented central portion correspondingly smaller on the 'dorsal' than on the 'ventral' surface. Additionally, the ornament of the dorsal surface narrows distally to form two rounded, hollow, antapical projections one on each side of the mid-line. The ventral surface is characterized by the larger size of the unornamented portion and the presence of two or three  $\pm$  prominent, tangentially directed antapical ridges (Pl. 24, fig. 6, 7).

The cover of the archeopyle is marked into three areas by low circular ridges (Pl. 24, fig. 5). The shell-membrane is thin *c.*  $1.5 \mu$  and finely and closely granular; several V-shaped notches are evident around the edge after the removal of the archeopyle cover.

**DIMENSIONS:** Holotype—overall length  $110 \mu$ ; overall width  $98 \mu$ , width of shell  $92 \mu$ . Range in complete specimens—overall length  $98-112 \mu$ ; overall width  $78-102 \mu$ .

**COMMENT:** *C. vitilare* can be distinguished from the described species of *Cyclonephelium* by the dorsiventrality of the shell and the characteristic type of ornament which seems to have resulted from the flattening, fusion, and perforation of low, much-branched ridges. It is frequent in the Pebble Point Formation at 4 ft from the base.

#### FAMILY UNCERTAIN

Genus **Trichodinium** Eisenack & Cookson

#### **Trichodinium hirsutum** n. sp.

(Pl. 25, fig. 5-13; holotype fig. 5-7, P 23120)

**AGE AND OCCURRENCE:** Paleocene: Pebble Point Formation, SW. Victoria, 4 ft above base.

**DESCRIPTION:** Shell almost spherical with a short, straight-sided, branched apical projection, an antapical projection with slanting sides and short, hair-like, terminal branches, an equatorial girdle apparently ending at the lateral margins and a pre-cingular hoof-shaped archeopyle. Shell-membrane relatively thick *c.*  $2.5 \mu$ , ornamented with solid, simple or branched, broad-based, pointed appendages the size and number of which vary according to their position on the shell. They are longest and most numerous along the margins, especially so in the region of the girdle; shorter, well-spaced or in small groups on the dorsal surface, with a tendency towards a linear arrangement parallel to the girdle which they outline (Pl. 25, fig. 10); while on the ventral surface they are very small, sparse and apparently absent from a narrow longitudinal mid-hypothecal zone suggestive of a longitudinal furrow, which they appear to outline (Pl. 25, fig. 12, 13). The cover of the archeopyle bears three or four short, stiff appendages (Pl. 25, fig. 8). The shell-membrane of the dorsal surface is marked into irregularly-shaped areas by ridges and the confluence of appendage bases several of which together form raised thickenings (Pl. 25, fig. 11). The sculptural elements of both surfaces are in the form of unevenly-spaced granules of varying size and shape.

**DIMENSIONS:** Holotype—overall length *c.*  $125 \mu$ , overall width *c.*  $100 \mu$ , shell *c.*  $90 \times 83 \mu$ ; anterior projection *c.*  $17.5 \mu$  long, posterior projection *c.*  $25 \mu$  long. Range—overall length  $100-167 \mu$ , overall width  $97-105 \mu$ , anterior projection  $25-28 \mu$  long, posterior projection  $20-30 \mu$  long, appendages  $7-25 \mu$  long.

**COMMENT:** Of the previously described species of *Trichodinium*, all of which are from Cretaceous deposits, the one to which *T. hirsutum* most closely approaches is the type species *T. pellitum* Eisenack & Cookson 1960. *T. hirsutum* differs from this species in the development of an antapical as well as an apical projection, its more apparent dorsiventrality, the coarser and longer appendages and the details of wall structure.

Genus *Svalbardella* Manum*Svalbardella australina* n. sp.

(Pl. 25, fig. 1-4; holotype fig. 4, P 23122)

*Ceratium* cf. *fuscus* forma *incerta* Deflandre in Deflandre & Cookson 1955, p. 293, Pl. 8, fig. 1.

AGE AND OCCURRENCE: Paleocene: Pebble Point Formation, SW. Victoria, at 4 ft and 6 ft above the base.

DESCRIPTION: Shell fusiform, tapering gradually from an enlarged central portion with convex sides towards both apex and antapex. The left-hand wall of the antapical portion (when the shell is lying with the ventral surface uppermost) narrows suddenly at about  $\frac{1}{3}$  of its length, in such a way that a small spine-like projection is developed, and then slants towards the pointed apex. The apical portion which terminates in either a bluntish or pointed tip is usually slightly longer than the corresponding antapical portion. The central part of the shell is generally entirely filled with a thin-walled capsule which narrows to varying degrees towards both ends and sometimes extends into the bases of the narrow portions of the shell (Pl. 25, fig. 2). The archcorypyle is small, intercalary and basically, though not always distinctly, hexagonal with alternating long and short sides (Pl. 25, fig. 4). A clearly defined tabulation has not been evident; in a few specimens faint indications of an equatorial girdle and faintly outlined areas are present on the dorsal surface (Pl. 25, fig. 1). A large clear area, frequently evident on the ventral surface (Pl. 25, fig. 2) may possibly be related to a longitudinal furrow.

Shell-membrane thin, c.  $0.5 \mu$ , smooth in optical section, faintly granular in surface view; wall of capsule finely and closely granular.

DIMENSIONS: Holotype— $270 \mu$  long,  $54 \mu$  broad. Range— $239-302 \mu$  long,  $40-61 \mu$  broad.

COMMENT: The genus *Svalbardella* was created by Manum (1960) for certain fusiform shells with intercalary archeopyles, equatorial girdles, and large centrally placed ellipsoid capsules, that were recovered from a Spitsbergen deposit the age of which was assumed on several grounds to be 'Upper Paleocene to Eocene'.

*S. australina*, while possessing the general characters of the genus *Svalbardella*, differs from the type species *S. cooksoniae* Manum (1960) in the narrower and longer apical and antapical portions of the shell, the shape of the capsule, the ornament (granular instead of reticulate), and the fainter representation of the girdle and tabulation.

The specimen doubtfully recorded as ? *Ceratium* cf. *fuscus* forma *incerta* Deflandre by Deflandre & Cookson 1955 can now be confidently assigned to *Svalbardella australina*. Although rather imperfectly preserved, it demonstrates the main features of this species. Furthermore it, also, was recovered from the Pebble Point Formation, although from a different exposure, namely on the NW. side of Point Bell at some distance from the type locality of *S. australina* SE. of Dilwyn Bay. This identification is supported by the finding of two other specimens in one of the original preparations from the same locality.

## Acknowledgement

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## References

- COOKSON, ISABEL C., 1953. Records of the occurrence of *Botryococcus braunii*, *Pediastrum* and the Hystrichosphaeridae in Cainozoic deposits in Australia. *Mem. Nat. Mus. Melbourne* 18: 107-123.
- , 1964. Cretaceous and Tertiary microplankton from south-eastern Australia. *Proc. Roy. Soc. Vict.* 78: 85-93.
- COOKSON, ISABEL C., and EISENACK, A., 1961. Tertiary microplankton from the Rottneest Island Bore, Western Australia. *J. Roy. Soc. W.A.* 44: 39-47.
- DEFLANDRE, G., and COOKSON, ISABEL C., 1955. Fossil microplankton from Australian Late Mesozoic and Tertiary sediments. *Aust. J. Mar. Freshw. Res.* 6: 242-313.
- EISENACK, A., and COOKSON, ISABEL C., 1960. Microplankton from Australian Lower Cretaceous sediments. *Proc. Roy. Soc. Vict.* 72: 1-10.
- GERLACH, ELLEN, 1961. Mikrofossilien aus den Oligozän und Miozän Nordwestdeutschlands. *N. Jb. Geol. Paläont.* 112: 143-228.
- MANUM, S., 1960. Some Dinoflagellates and Hystrichosphaerids from the Lower Tertiary of Spitsbergen. *Nytt Mag. Botanikk* 8: 17-25.

## Explanation of Plates

All figured specimens are from 4 ft above the base of the Pebble Point Formation, except P 23123 and 23452 which are from 6 ft above.

## PLATE 24

- Fig. 1-7—*Cyclonephelium vitilare* n. sp.  $\times$  c. 480. 1, 2, dorsal and ventral surfaces of holotype (P 23118); 3-5, dorsal surfaces of 3 specimens showing structural variation of the ornament (P 23126-7, P 23448); 6, ventral surface of paratype (P 23119) showing antapical ridges; 7, a slightly oblique view of an antapex (P 23449).
- Fig. 8, 8a, 9—*Cyclonephelium retinertextum* Cookson. 8, whole specimen (P 23450)  $\times$  c. 320; 8a, detached archeopyle cover (P 23453)  $\times$  c. 480; 9 (P 23451)  $\times$  c. 320.
- Fig. 10, 11—? cf. *Cyclonephelium reticulosum* Gerlach, shell and detached archcopyle cover of the same specimen (P 23452)  $\times$  c. 480.

## PLATE 25

- Fig. 1-4—*Svalbardella australina* n. sp. 1 (P 23125)  $\times$  c. 330. 2, ventral surface of paratype (P 23123)  $\times$  c. 360; 3 (P 23124)  $\times$  c. 360; 4, holotype (P 23122)  $\times$  c. 360.
- Fig. 5-13—*Trichodinium hirsutum* n. sp. 5-7, 3 views of holotype (P 23120); 5, dorsal surface; 6, optical section; 7, ventral surface  $\times$  c. 400; 8, dorsal surface (P 23454)  $\times$  c. 400; 9, 10, paratype (P 23121); 9, optical section; 10, dorsal surface  $\times$  c. 400; 11, portion of the dorsal surface of another specimen (P 23455)  $\times$  c. 480; 12, 13, ventral surface of hypothecae of 2 specimens (P 23457, P 23456)  $\times$  c. 480.